Lab captures five R&D100 awards for 2010

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LOS ALAMOS, New Mexico, JULY 8, 2010—Los Alamos National Laboratory scientists have won five of R&D Magazine's R&D100 Awards. Recognized as the "Oscars of Invention" by the Chicago Tribune, these awards honor the top 100 proven technological advances of the past year. Winning Laboratory projects are DAAFox, MOXIE, Solution Deposition Planarization, Ultraconductus, and Ultrasonic Algal Biofuel Harvester.

"I want to congratulate all of this year's winners on their awards and to thank them for their work," Energy Secretary Steven Chu said. "The large number of winners from the Department of Energy's national labs every year is a clear sign that our labs are doing some of the most innovative research in the world. This work benefits us all by enhancing America's competitiveness, ensuring our security, providing new energy solutions, and expanding the frontiers of our knowledge. Our national labs are truly national treasures, and it is wonderful to see their work recognized once again."

"The scientific innovation and creativity at Los Alamos is exemplified by yet another set of five R&D100 awards," said Laboratory director Michael Anastasio. "My congratulations go out not only to this year's winners, but to all eight teams chosen to submit entries, each one an example of the talent and determination of our excellent technical staff to produce game-changing science and technology in the national interest."

A greener shade of explosive

Los Alamos scientists, led by Elizabeth Francois of the Lab's high explosive science and technology group, have developed a new way to make a type of explosive with the chemical name DiAminoAzoxyFurazan, or DAAFox, for short. The new synthesis method results in an explosive material with an ideal combination of physical characteristics. DAAFox packs a punch — delivering more explosive power with less material. It's insensitive — it resists ignition, reducing the possibility of accidental detonation. It's green—the synthesis method is environmentally friendly. And it's easy to make — a one-step process produces both small and large batches in just a few hours.

Super slow-mo science movies

Extreme slow motion moviemaking is essential in science, especially the science of nuclear weapons and energetic materials. Slowing down the action allows scientists to see, for example, how explosives might ignite and how blast pressure waves move and grow. MOXIE's developer is Scott Watson of the advanced nuclear technology group.

The uses for MOXIE include nuclear weapon certification without nuclear testing through X-ray movies of mock detonations, used to verify computer models. The camera enables scientists to study the physical properties of materials, including equations of state, fusion plasmas, discharge formation, shock physics, and fracture mechanics. It also facilitates ballistic studies by recording detailed movies of improvised explosive devices.

Making a better supconducting wire

Los Alamos scientists have been working for years to improve superconductor technology and reduce the costs of making superconducting materials. Solution Deposition Planarization is the latest technological advance from Vladimir Matias of the Lab's materials physics and applications division, which seeks to reduce production costs, while supporting significantly higher power densities.

The SDP process is simpler, and environmentally green, with virtually no toxic manufacturing waste.

Superconducting wires made through the SDP process can enable long-length energy transmission with zero energy loss, wind turbine engines that are lighter, smaller, and more efficient, and large industrial electric motors that are more efficient and compact. The SDP process also has applications in naval propulsion, with smaller, lighter motors that feature less vibration and are quieter. The process can also help realize significant improvements to photovoltaic solar arrays and other electro-optics.

An electrical conductor of a different sort

Ultraconductus is a new nanotechnology, developed by James Maxwell of LANL's applied electromagnetics group, for the manufacture of high-tech wires and cables that conduct electricity more easily than any other metal alloy. The wires possess a greater tensile strength than steel and operate at room temperatures and higher. The technology involves growing long-length metallic nanotubes while simultaneously cladding them within a metal matrix.

The wires do not require cooling, unlike superconductors, and are not subject to some physical limitations that lead to power loss, such as high current density and magnetic field quench, a limit to the maximum magnetic field that can be achieved in a superconductor.

Ultraconductus can be used to make high-voltage cables for transmission of electricity to homes and businesses, and motors and generators for use in powering everything from simple electronics to large scale manufacturing systems. The technology can also make wires that can be used in common products like cell phones and televisions, and in specialized applications that require wires with exceptional tensile strength.

Soundwaves shake biofuel from algae

The ultrasonic biofuel harvester, developed by Greg Goddard of the Lab's bioscience division, uses extremely high frequency sound waves to harvest and extract oils and proteins from algae, separating out and recycling the water, all in one integrated system. No other technology uses a single method to capture all three valuable components of algae.

The ultrasonic harvester is a low-cost, environmentally green, energy-efficient process for using algae as a fuel and feed source. It can make algal biofuels more cost-competitive with current fuels and make them more available. The technology eliminates the traditional use of solvents to extract agal oils, and the associated risks to

both humans and the environment. Algal carbohydrates can be used to produce both ethanol or methane and the proteins can be used to feed cattle, poultry, and fish.

Since 1978 Los Alamos has won 117 of the prestigious R&D100 awards that celebrate the top 100 proven technological advances of the year as judged by R&D Magazine. These technologies include innovative new materials, chemistry breakthroughs, biomedical products, consumer items, testing equipment, and high-energy physics. The awards involve industry, academia, and government-sponsored research.